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Test 1187: Massey-Ferguson MF 235 Diesel

Tractor Museum
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NEBRASKA TRACTOR TEST 1187 – MASSEY-FERGUSON MF 235 DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—722 rpm)								
42.39	2250	2.586	0.422	16.39	181	63	75	29.040
Standard Power Take-off Speed (540 rpm)—One Hour								
35.29	1683	2.102	0.412	16.78	180	63	75	29.060
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
36.85	2302	2.288	0.429	16.11	178	64	75	.....
0.00	2427	0.764	.....	.....	146	64	75	.....
18.92	2363	1.463	0.534	12.94	168	64	75	.....
42.36	2251	2.578	0.421	16.43	180	65	76	.....
9.60	2399	1.103	0.794	8.71	158	65	76	.....
28.00	2331	1.841	0.454	15.21	174	66	77	.....
Av 22.62	**2345**	**1.673**	**0.511**	**13.52**	**167**	**65**	**76**	**29.057**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Fuel Consumption Slip of drivers %	Gal per hr	Lb per hp-hr	Hp-hr per gal	Temp Degrees F Cool-ing med	Air wet bulb	Air dry bulb	Barometer inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours 4th (4L) Gear											
34.95	2776	4.72	2248	8.97	2.532	0.501	13.80	181	46	58	29.190
75% of Pull at Maximum Power—Ten Hours 4th (4L) Gear											
27.99	2123	4.94	2301	6.82	2.091	0.516	13.39	174	59	63	28.994
50% of Pull at Maximum Power—Two Hours 4th (4L) Gear											
19.86	1448	5.14	2345	4.88	1.718	0.598	11.56	160	51	55	29.080
50% of Pull at Reduced Engine Speed—Two Hours 5th (1H) Gear											
20.49	1496	5.14	1933	4.91	1.574	0.531	13.02	156	43	46	29.220
MAXIMUM POWER WITH BALLAST											
23.16	4281	2.03	2322	14.88	2nd Gear (2L)			176	61	67	29.120
34.47	3445	3.75	2248	11.39	3rd Gear (3L)			181	62	68	29.110
35.62	2822	4.73	2248	8.74	4th Gear (4L)			177	50	55	29.080
36.29	2329	5.84	2252	7.33	5th Gear (1H)			177	50	55	29.080
35.55	1518	8.78	2253	4.94	6th Gear (2H)			177	50	55	29.080

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—(4th Gear 4L)

Pounds Pull	2822	3004	3160	3263	3294	3145
Horsepower	35.62	33.84	31.50	28.38	24.55	19.70
Crankshaft Speed rpm	2248	2019	1796	1574	1350	1133
Miles Per Hour	4.73	4.22	3.74	3.26	2.79	2.35
Slip of Drivers %	8.74	9.10	9.81	10.11	10.31	9.91

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power 2 Hours	98.5
75% of Pull at Max. Power 10 Hours	98.5
50% of Pull at Max. Power 2 Hours	97.0
50% of Pull at Reduced Engine Speed 2 Hours	96.0
Bystander (in 7th—3H gear)	91.0

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi	Two 13.6-28; 4; 14	Two 13.6-28; 4; 14
Ballast	—Liquid	492 lb each	None
	Cast Iron	291 lb each	None
Front Tires	—No., size, ply & psi	Two 6.00-16; 4; 32	Two 6.00-16; 4; 32
Ballast	—Liquid	None	None
	Cast Iron	80 lb each	None
Height of drawbar		22.5 inches	22.5 inches
Static weight with operator—rear		4190 lb	2625 lb
	front	1670 lb	1510 lb
	total	5860 lb	4135 lb

Department of Agricultural Engineering

Dates of Test: September 4 to September 18, 1975

Manufacturer: MASSEY-FERGUSON INC., 1901 Bell Avenue, Des Moines, Iowa 50315

FUEL, OIL AND TIME **Fuel** No 2 Diesel **Cetane No** 51.7 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.830 **Weight per gallon** 6.911 lb **Oil SAE** 20-20W **API service classification** SB/SE-CA/CC **To motor** 1.632 gal **Drained from motor** 1.237 gal **Transmission and final drive lubricant** Massey-Ferguson Oil M-1129 (A) **Total time engine was operated** 45 hours.

ENGINE **Make** Perkins **Type** 3 cylinder **Serial No** 20 489 DSL **Crankshaft Mounted** lengthwise **Rated rpm** 2250 **Bore and stroke** 3.6″ x 5″ **Compression ratio** 16.5 to 1 **Displacement** 153 cu. in. **Lubrication** pressure **Cranking** system 12 volt **Air cleaner** dry dual pleated paper element **Oil filter** full flow paper cartridge **Fuel filter** pleated paper element **Muffler** vertical **Cooling medium temperature control** thermostat.

CHASSIS **Type** standard **Serial No.** 9A 220 137 **Tread width** rear 48″ to 76″ front 48″ to 80″ **Wheel base** 74.5″ **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 27.75″ Vertical distance above roadway 37.75″ Horizontal distance from center of rear wheel tread 0.47″ to the left **Hydraulic control system** constant running except when PTO clutch is disengaged **Transmission** selective gear fixed ratio **Advertised speeds mph** first 1.6 second 2.3 third 4.2 fourth 5.2 fifth 6.3 sixth 9.2 seventh 16.9 eighth 20.8 reverse 2.2, 8.6 **Clutch** single plate dry disc operated by foot pedal **Brakes** internal expanding shoes operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 102″ left 105″ (on concrete surface without brake) right 113″ left 114″ **Turning space diameter** (on concrete surface with brake applied) right 211″ left 217″ (on concrete surface without brake) right 232″ left 234″ **Power take-off** 540 rpm at 1683 engine rpm.

REPAIRS AND ADJUSTMENTS: During run-in period steering wheel oil seal had to be replaced.

REMARKS:: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Fuel temperature at injection pump return was 144°F. Five gears were chosen between 15% slip and 15 mph (only one gear permitted over 8 mph).

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1187.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
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Board of Tractor Test Engineers

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
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EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories may be disconnected only when the means for disconnecting can be reached from the operator station. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. Prior to the maximum power run the tire tread-bar height must be at least 65% of new tread height.

POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ of the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general use.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effects of speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 4 different runs as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; (3) 50% of the pull at maximum power; and (4) maintaining the same load and travel speed as in (3) by shifting to a higher gear and reducing the engine rpm.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 6 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe limit for the test course. The manufacturer's representative has the option of selecting one gear or speed over eight miles per hour. The maximum safe speed for the Nebraska Test Course has been set at 15 mph. The slip limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Varying Drawbar Pull and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

SOUND MEASUREMENT

Sound is recorded during each of the Varying Power and Fuel Consumption runs as the tractor travels on a straight section of the test course. The dB(A) sound level is obtained with the microphone located near the right ear of the operator. Bystander sound readings are taken with the microphone placed 25 feet from the line of travel of the tractor.

An increase of 10 dB(A) will approximately double the loudness to the human ear.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska** 68583.

FERGUSON MF 235 DIESEL